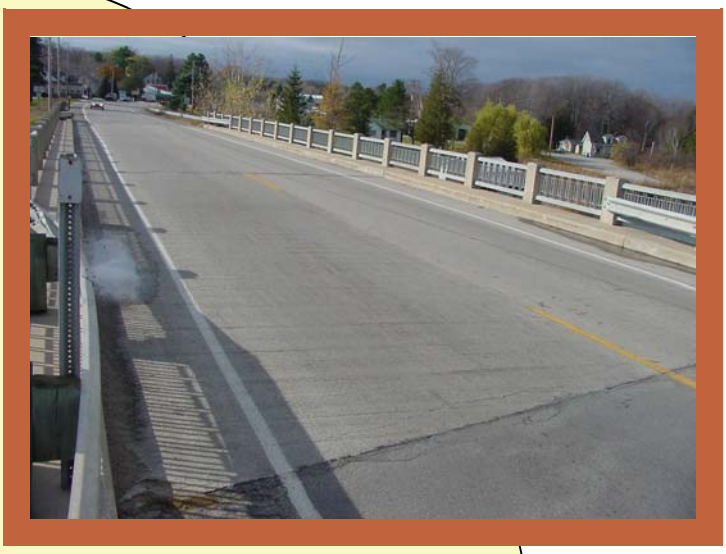
BRIDGE



CAPITAL SCHEDULED MAINTENANCE

Manual

MDOT
Michigan Department of Transportation

Chapter 1

INTRODUCTION

The Capital Scheduled Maintenance program (CSM) was conceived in committee in late 1997 and approved by Leadership 1998 as part of the development of MDOT's Strategic Investment Plan for Trunkline Bridges. A portion of the overall budget within the Bridge Preservation template was set aside to establish resources for preserving bridges in their current condition state for a longer period of time. The CSM program is new to the Bridge Preservation template and this document is intended to give guidance for use of these resources.

Typical CSM work activities include:

- ✓ Superstructure Washing
- ✓ Vegetation Control
- ✓ Drainage System Cleaning / Repair
- ✓ Spot Painting
- ✓ Joint Repair / Replacement
- ✓ Concrete Coating / Sealing
- ✓ Minor Concrete Patching and Repair
- ✓ Concrete Crack Sealing
- ✓ Approach Pavement Relief Joints
- ✓ Slope Paving Repair

The bridge CSM program is administered by the Bridge Operations Unit of the Construction and Technology Support Area. Questions or comments may be directed to:

Linda M. Reed, P.E.
Bridge Scoping Engineer
517-322-5622
e-mail: reedl@michigan.gov

Chapter 2

SCOPING GUIDELINES FOR CSM WORK

A. INITIAL PROJECT SELECTION

From the Strategic Investment Plan for Trunkline Bridges: "Scheduled maintenance activities maintain the existing serviceability, and reduce deterioration rates on bridges". CSM work activities sustain the current bridge condition longer, whether the current condition is good or poor. Use the following general concepts when setting up projects for CSM work:

- The anticipated work should have little or no impact to traffic and have very little traffic control costs.
- The work should be of short duration, typically completed within one working day.
- The work should be focused on activities that if left unattended will cause deterioration of the structure leading to more expensive repairs.
- Priority should be given to corridors where the same small task can be performed on many bridges.

From the definition above, starting with "worst bridges first" will not work. The intended outcome from this program is to delay structural deterioration as long as possible, and to accomplish this, certain work activities must be performed on the bridge system.

Therefore, the first step in the process is to identify bridges that are good candidates for CSM work activities and are fairly close together so they can be grouped as one project. From these groups, evaluate the most appropriate work activities by reviewing the inspection comments on the NBI Inspection Reports.

There are two ways to bundle projects for these work activities: set up a project to do one work activity on a group of bridges, or take a group of bridges and do all of the work activities that are necessary to that group. The Region Bridge Engineer may package the contract as it best suits their bridge network.

B. TYPICAL CSM WORK ACTIVITIES

- ◊ Superstructure Washing
- ◊ Vegetation Control
- ◊ Drainage System Cleaning / Repair
- ◊ Spot Painting
- ◊ Joint Repair / Replacement
- ◊ Concrete Coating / Sealing
- ◊ Minor Concrete Patching and Repair
- ◊ Concrete Crack Sealing
- ◊ Approach Pavement Relief Joints
- ◊ Slope Protection Repair

Each individual work activity is defined in the following chapters, along with a brief description of how to scope it, special provisions to use, and appropriate pay items.

Please note: The first two activities listed (superstructure washing and vegetation control) are not currently eligible for federal funding and thus cannot be contracted out at this time.

C. SCOPING SITE VISIT

After the bridges have been identified as potential candidates for a CSM project, each bridge must be visited to confirm the appropriateness of the proposed work activity and to determine the estimated quantity of each pay item at that structure. This data is entered into the electronic version of the CSM Bridge Project Cost Estimate Worksheet, explained below and in Chapter 14.

D. ESTIMATING

Chapter 14 contains a copy of the CSM Bridge Project Cost Estimate worksheet, with unit prices of all of the work activities and applicable pay items. Some work activities will require the combining of several pay items, such as when making slope paving repairs where structure embankment may be necessary to fill the voids prior to placing new slope paving and headers.

On the worksheet, fill in the bridge number, the location, and quantities for the selected work activities or pay items, and the estimated project cost for that bridge will be calculated. The Excel file for this estimating workbook includes 30 Bridge Estimate Sheets and a Project Summary. For multiple bridge entries, the information on the Estimate Sheets will be transferred to the Project Summary and totaled.

E. SCOPING PACKAGE SUBMITTAL (to Bridge Operations Unit of C&T)

The following scoping documents are to be turned in to the Bridge Operations Unit of C&T for Project Programming:

1. Program Revision Request
2. Project Concept Statement (MPINS)
3. CSM Bridge Project Cost Estimate
4. Current Inspection Report (BIR or CIR)
5. Photographs of the Bridge (note: photographs are needed only if project is being designed by the Bridge Design Unit in Lansing)

In a cover memo, list the bridges that are to be packaged together for each CSM project.

Note - Until MPINS is set up with a cost estimate form specifically for CSM projects, input only the total cost per structure on the Project Concept Statement under "bridge cost", work item "miscellaneous", unit cost "other".

F. OEC MEETING

An Omissions / Errors, and Check meeting must be held for all bridge CSM projects. This meeting is usually arranged by the Project Manager and held in the TSC or Region office. The Bridge Quality Assurance Engineer from Lansing Design must be in attendance. Prior to the OEC meeting, the proposal package must be sent to the following, (at minimum) for review:

Bridge Quality Assurance Engineer – Design	(currently Jennifer Transue)
Bridge Scoping Engineer – C&T	(currently Linda Reed)
Bridge Construction Engineer – C&T	(currently Eric Burns)
Lansing Traffic and Safety	

G. DESIGN PACKAGE SUBMITTAL (to Specs and Estimates in Design)

For CSM projects designed in the Region, the following documents must be turned in to the Specifications and Estimates section of Design to advertise the project for bid letting:

1. Advertising data sheet
2. Submission of Proposal Package checklist
3. Project Certification Acceptance form (Road CPM version)
4. Utility Company listing
5. Utility Relocation Status Report
6. TRNSPORT - both bid based and cost summary by proposal
7. Title Sheet
8. Plan Notes
9. Log of Project
10. Progress Clause
11. Log Job details
12. Maintaining Traffic Special Provision
13. Special Provisions and Supplemental Specifications
14. Notice to Bidders
15. Permits (if applicable)
16. Railroad Special Provisions, Permits, Notice to Bidders (if applicable)

Packaging the above documents can be challenging the first few times. Since the process is the same as for Road projects, the Region/TSC Road Design unit can be a valuable resource if assistance is needed.

Project Certification Acceptance form (item #3 above) - The **Certification & Acceptance – Type 2** form (CA form) may be used for Bridge CSM projects. This is a condensed version of the standard (Type 1) CA form, and is available on the MDOT Interchange or from MDOT Forms (#253). The CA form is a PDF document which requires Adobe Acrobat Reader. A copy of the CA form can be found in Appendix A of this manual, but it is recommended that the most current version be downloaded for each project. The address on the MDOT Interchange is:

http://mdotwas1.mdot.state.mi.us/public/webforms/public/0253.pdf

H. RAILROAD GRADE SEPARATIONS

Any work that has the potential to affect the safety of railroad operations and/or the clearance envelope requires coordination with the railroad through the Governmental & Railroad Coordination unit of the Design Support Area. The lead time needed to complete railroad coordination activities typically takes several months, so early notification is essential. All projects involving railroad coordination also need to establish a dollar amount for “Railroad Inspection and Flagging”. It is recommended that this be set at $600 per day times the number of days the contractor will be working. Since the CSM program is intended to produce projects that will be uncomplicated and of short duration, projects requiring railroad coordination may want to be avoided.

The following work activities would not impact the railroad and thus would not likely require railroad coordination:

1. Approach pavement relief joints
2. Concrete sealing only on the bridge deck or inside (roadside) faces of bridge barrier railing.
3. Any work activity that is more than 50' away from the nearest railroad track, as long as there is no possibility of workers crossing the track or equipment within 50' of the track, and if the construction activity would not adversely affect the railroad.

If in doubt, contact Steve Rapp in the Governmental & Railroad Coordination unit of the Design Support Area.

Chapter 3

SUPERSTRUCTURE WASHING

This work activity cannot be contracted out at this time. Expect to do this work with state forces.

Chapter 4

VEGETATION CONTROL

This work activity cannot be contracted out at this time. Expect to do this work with state forces.

Chapter 5

DRAINAGE SYSTEM CLEANING / REPAIR

CLEANING - Drainage system flushing is not to be contracted out at this time due to environmental concerns by the DEQ.

REPAIR - The purpose of this work activity is to ensure that all aspects of drain systems on a bridge are operational and performing as designed or as modified.

Inspect each drain casting, supporting deck structure, downspout, and collection box (if applicable) from both the surface and the underside. If the deck structure around the casting is delaminated on the surface or on the underside, estimate the area of hand chipping and patching required to provide better support for the drain casting and the downspout (see also Chapter 9 of this manual). Determine the need for deck drain extensions, downspout replacement, and end header box systems.

For CSM projects involving drain casting replacement, or any complex drainage system repair, it is highly recommended that a bridge design unit in Lansing be contacted for assistance. The design engineer will determine the proper number, size, and layout of epoxy coated steel reinforcement and adhesive anchored horizontal bars. Replacement of the drain casting systems are estimated by calculating the following quantities:

1. Number of castings to be removed, to be paid for as Structures, Rehabilitation, Remove Portions. A note should be placed on the plans that sawcutting and removal of concrete adjacent to the drain casting (limits to be called out in the plan details) are included in the pay item Structures, Rehabilitation, Remove Portions. This item will be bid lump sum but estimated as “each”.

2. Amount of deep chipping necessary for removal of delaminated concrete beyond that necessary for drain casting removal, to be paid for as Hand Chipping, Deep.

3. Number of new castings required, to be paid for as Drain Casting, Type ___ or Drain Casting Assembly, Type ___. The cost of furnishing and installing the downspout and lower bracket (if necessary) is included in the pay item Drain Casting Assembly, Type ___.

4. Amount of concrete and steel reinforcement necessary to form around the new casting, to be paid for as Patching Concrete, C-L; Patch Forming; Reinforcement, Steel, Epoxy Coated; and Adhesive Anchoring of Horizontal Bars, ___ inch.

See English Special Detail B-101-C “Drain Casting Assembly Details”, and Sections 712 and 717 of the MDOT Standard Specifications for Construction.

Descriptions for pay items associated with this type of work can be found in the Standard Specifications for Construction. Some of those items are listed below:

- Structures, Rehabilitation, Remove Portions [Lump Sum]
- Drain Casting, Type 1 [Each]
- Drain Casting, Type 2 [Each]
- Drain Casting Assembly, Type 1 [Each]
- Drain Casting Assembly, Type 2 [Each]
- Deck Drain Extension [Each]
- Downspout Replacement [Each]
- Hand Chipping, Deep [Square Yard]
- Patch, Forming [Square Foot]
- Reinforcement, Steel, Epoxy Coated [Pounds]
- Adhesive Anchoring of Horizontal Bar, ___ inch [Each]
- Patching Concrete, C-L [Cubic Yard]

See also the following Special Provisions, to be used as appropriate:

A. PVC DOWNSPOUT

The Spec book and Standard Plan B-101-C is set up for downspout replacement with polyethylene pipe. To call for a PVC downspout, use the attached special provision and the miscellaneous pay item code for PVC Downspout instead of the standard pay item for Downspout Replacement.

Pay Item: PVC Downspout [Each]

B. PE END HEADER BOX SYSTEM

The bridge drainage system may include a drainage trough or end header box system to collect runoff from the deck drain or scupper and connect it to a funnel linked to an outlet pipe or downspout. Use the following special provision if this end header box system is in need of replacement.

Pay Item: PE End Header Box System [Each]

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
PVC DOWNSPOUT

GR:TELLIER 1 of 1 C&T:APPR:EMB:GJB:12-18-01

a. Description. This work shall consist of furnishing and installing a rigid Polyvinyl Chloride (PVC) Downspout from the funnel to the existing ground level including the funnel. A PVC deflection system shall be included at the outlet of the drainage system connected to the downspout to deflect water away from the existing slopes and cars in the parking lot. The removal and disposal of the existing cast downspouts from the funnel to the in ground connection, as well as abandoning the existing connection into the sewer system, shall be included in this pay item. This work shall include all fittings and anchoring materials. This work shall also include the clean out and disposal of all material in each drainage system.

b. Materials. The pipe and fittings shall conform to the requirements of ASTM D-2665, Schedule 40.

All plastic pipe and fittings used throughout the project shall be of the same brand name (same manufacturer).

Solvents and glues shall be recommended by the manufacturer as compatible with the pipe and fittings supplied.

All anchor bolts/connectors shall be galvanized according to AASHTO 232 and the epoxy system shall be from the MDOT approved products list. The existing anchors shall be removed and the concrete shall be patched according to other Special Provisions in this contract. The design of the anchor bolts shall be equal or greater than that shown on the existing drawings. Design calculations shall be submitted with the shop drawings before installation.

c. Construction. Installation shall be in accordance with section 717 of the Standard Specifications. The pipe and fittings shall be joined in the manner as recommended by the manufacturer.

d. Measurement and Payment. The completed work as measured for PVC Downspout will be paid for at the contract unit price for the following contract item (pay item):

Contract Item (Pay Item)	**Pay Unit**
PVC Downspout	Each

The item **PVC Downspout** shall be payment in full for furnishing all labor, equipment, and materials necessary to complete the installation of the downspout as detailed, including fittings, anchor bolts, straps, deflection system and miscellaneous hardware. **PVC Downspout** also includes payment in full for removing and disposing of existing cast downspouts, abandoning the existing connection into the sewer system, and cleanout and disposal of all material in each drainage system. **Shop drawings shall be submitted and approved by the Project Engineer prior to installation**.

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SPECIAL PROVISION
FOR
PE END HEADER BOX SYSTEM

GR:TELLIER 1 of 1 C&T:APPR:EMB:GJB:06-06-02

a. Description. This work shall consist of furnishing and installing a rigid Polyethylene (PE) End Header Box System. The removal and disposal of the existing cast End Header Box Systems from the existing bridge scupper pipe to the existing funnel as part of the downspout shall be included in this pay item. This work shall include all fittings and anchoring materials. This work shall also include the clean out and disposal of all material in each drainage system.

b. Materials. The pipe and fittings shall conform to the requirements of ASTM D 3350, Schedule 40.

All plastic pipe and fittings used throughout the project shall be of the same brand name (same manufacturer).

Solvents and glues shall be recommended by the manufacturer as compatible with the pipe and fittings supplied.

All anchor bolts/connectors shall be galvanized according to AASHTO 232 and the epoxy system shall be from the MDOT approved products list. The existing anchors shall be removed and the concrete shall be patched according to other Special Provisions in this contract. The design of the anchor bolts shall be equal or greater than that shown on the existing drawings. Design calculations shall be submitted with the shop drawings before installation.

c. Construction. Installation shall be in accordance with section 717 of the Standard Specifications for Construction. The pipe and fittings shall be joined in the manner as recommended by the manufacturer.

d. Measurement and Payment. The completed work as measured for PE End Header Box System will be paid for at the contract unit price for the following contract item (pay item):

Contract Item (Pay Item)	**Pay Unit**
PE End Header Box System	Each

The item **PE End Header Box System** shall be payment in full for furnishing all labor, equipment, and materials necessary to complete the installation of the **PE End Header Box System** as described, including fittings, anchor bolts, straps, and miscellaneous hardware. **PE End Header Box System** also includes payment in full for removing and disposing of existing cast end header box systems, and cleanout and disposal of all material in each drainage system. **Shop drawings shall be submitted and approved by the Project Engineer prior to installation.**

Chapter 6

SPOT PAINTING

The purpose of this work activity is to repair small localized areas of paint failure to prevent further decline of the paint system and corrosion of the steel. Spot painting is appropriate when there are isolated areas of paint failure (less than 5% of the painted area).

Spot painting should only be performed on structures with existing zinc based coatings. **Do not spot paint bridges with lead based paint systems.**

See the following Special Provision:

SPOT PAINT EXISTING STEEL STRUCTURES

This special provision differs from the special provision for Partial Painting Existing Steel Structures only in that negative pressure within the containment is not required.

The Site Identification numbers for all bridges scheduled for painting must be placed on the project title sheet. These numbers can be obtained from the Bridge Management Section of C&T. See the Bridge Design Manual, sections 8.02.F and 12.07.08 for more information.

To determine a lump sum cost estimate for this work, measure the areas of the bridge to be spot painted and enter that value on the CSM cost estimate worksheet. On this worksheet, the unit cost per area includes cleaning and coating of the structural steel to be painted.

To determine a cost estimate for design, apply 80% of this lump sum value to cleaning and 20% to coating.

Since the contractor will be bidding this item as lump sum, the designer must **include an informational quantity** for the areas to be spot painted in the plans or proposal. This quantity, in square feet, will essentially be the same as that used for estimating purposes.

Pay Items:	Steel Structure, Cleaning, Spot, Type 4 (*Str. #*)	[Lump Sum]
	Steel Structure, Coating, Spot, Type 4 (*Str. #*)	[Lump Sum]

MICHIGAN
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SPECIAL PROVISION
FOR
SPOT CLEANING AND COATING EXISTING STEEL STRUCTURES COATED WITH TYPE 1, 1S, 3, 4, OR 4S SYSTEMS

a. Description. This work consists of partial cleaning and coating metal surfaces of existing steel structures coated with non-lead paint systems to the limits, and including the details, as shown on the plans. The cleaning and coating of areas bare steel and damaged coating will be in accordance with Section 715 of the Standard Specifications for Construction, except as modified herein. Care will be taken as not to damage the existing coating system.

b. Materials. Water used for power washing and power rinsing structural steel will be clean and potable in accordance with Section 911 of the Standard Specifications for Construction.

An industrial, non-sudsing, biodegradable detergent will be mixed at the manufacturer's recommended rate with the wash water. Submit product data sheets to the Engineer.

c. Equipment. Equip the spray wand(s) used in power washing with a 0° spinner nozzle. Provide a tee fitting and pressure gage to measure line pressure at the spray wand and such measurements will be made at the direction of the Engineer. Equip the power washer(s) with properly placed gages and pressure regulators to ascertain and regulate water pressure. Size the power washers so that no combination of hose length or power washer placement will result in an output pressure of less than 900 psi and not to exceed 1150 psi as measured at a spray wand at any power wand location.

d. Construction.

Negative Pressure. Negative pressure within the containment is not required.

Power Washing. Before power washing surfaces to be top coated, remove all oil and grease deposits by solvent cleaning according to SSPC-SP 1. Power wash all steel to be coated by power washing with a detergent and water solution to remove all visible oil, and debris. The detergent will be added at the manufacturer's recommended rate to the wash water by means of a siphon device or pressure pump capable of overcoming the inlet line pressure. Install a back flow prevention device in the supply line prior to the detergent introduction point. A premixed holding tank may also be used. Wash the beams from top to bottom with the nozzle held at a maximum of 6 inches from and perpendicular to the steel surface. Move the nozzle properly (slowly) to prevent missed areas or visible “swirl” lines on the paint surface. Clean as necessary to remove all visible “swirl” lines, dirt, chalked paint, oil, grease, diesel fumes, diesel smoke, tar, road salt, and bird contamination, or other natural foreign matter prior to painting. On all surfaces not cleaned satisfactorily by power washing, remove foreign matter by one or a combination of the following: brush with stiff fiber or wire bristles, abrade, scrape, steam clean or clean with solutions of appropriate cleaners.

Feathered Edges. Feather the edges of the existing coating, created by the method of surface preparation prior to the application of the spot repair coats.

Profile Existing Sound Top Coat. For structural steel coated with Type 3, 4 or 4S systems, roughen the existing urethane top coat to create a surface for the new urethane to adhere. Roughen existing urethane prior to power rinsing.

Power Rinse. Rinse all steel surfaces to be top coated with water at a minimum of 900 and a maximum of 1150 psi, which is required to remove detergent residue, debris, and chloride contamination from the steel surfaces. Wash the beams from top to bottom with the nozzle held at a minimum of 4 inches to a maximum of 8 inches from and perpendicular to the steel surface. Move the nozzle slowly to prevent missed areas on the paint surface. A minimum of two passes of the stream is required over each area being cleaned.

Stenciling Requirement. If the fascia beam is completely coated the stenciling requirements are the same as in section 715.03D5 except that the coating type designation will be preceded by the letter 'S' (e.g., 10/00-S4).

If the fascia beam is not completely coated, stencil the completion date (month and year), the spot cleaning and coating designation, and the coating type (e.g., 10/00-S4) on the traffic side of each fascia beam in the lower right corner of the newly painted section. Put the two required markings completely within the partial coating limits, no closer than 3 inches above the bottom flange and with the stenciling ending within 3 inches of the right edge of the newly painted area. If these locations are not applicable to the structure, the Engineer will designate the locations of the markings.

e. Measurement and Payment. The completed work, measured as lump sum, will be paid for at the contract unit price for the following contract items (pay items).

Contract Item (Pay Item)	**Pay Unit**
Steel Structure, Cleaning, Spot, Type 4 (*Structure number*)	Lump Sum
Steel Structure, Coating, Spot, Type 4 (*Structure number*)	Lump Sum

Payment for **Steel Structure, Cleaning, Spot, Type 4 (Structure Number)** and **Steel Structure, Coatings, Spot, Type 4 (Structure Number)** includes all labor, materials, and equipment necessary to complete cleaning and coating of the structure as shown on the plans.

Stenciling is part of the work and will not be paid for separately. Where called for on the plans, cleaning and coating existing utility conduits (including all brackets and hangers), is part of the work and will not be paid for separately.

Chapter 7

JOINT REPAIR / REPLACEMENT

The purpose of this work activity is to fix or replace bridge construction, expansion, or compression seal joints, and end headers.

A. Resealing Bridge Construction Joints - See the following Special Provision:

RESEALING BRIDGE CONSTRUCTION JOINTS WITH LOW-MODULUS HOT-POURED RUBBER

The repair method is to remove the gland (if there is one) or existing joint seal, install a backer rod, and place hot poured rubber. See Section 914.04 and Subsection 602.03.S.4 of the MDOT Standard Specifications for Construction.

Measure the length of the joints and enter this quantity on the CSM cost estimate sheet. The unit cost covers removal of the existing joint material, cleaning the joint, and furnishing and installing the backer rod and hot-poured rubber.

Pay Item: Resealing Bridge Construction Joints [Foot]

B. End Header Replacement

Bridge end header replacement is a standard pay item found in Section 712 of the MDOT Standard Specifications for Construction. All work necessary for this activity, (including removal), is included in the pay item:

- End Header Replacement [Foot]

C. Expansion Joint Replacement

Sample details for expansion joint replacement can be provided upon request. It is, however, highly recommended that an engineer in Bridge Design be consulted for the most current joint replacement methods and expansion joint details. They can also provide assistance with the dimension for “minimum total travel along centerline of bridge”, to be filled in on the joint detail sheet. See also Sections 706 and 712 of the MDOT Standard Specifications for Construction.

Galvanic Anodes – The use of embedded galvanic anodes is suggested for joint replacement projects on decks with uncoated steel reinforcement. If the joints are being replaced because of concrete failure and rebar corrosion, the use of galvanic anodes (spaced a maximum of 24" apart) would be beneficial to mitigate the formation of new corrosion sites in the existing concrete. However, for joints being replaced primarily due the failure of the joint material, where rebar has not corroded, anodes are unwarranted. See the Bridge Design Manual section 12.08.02 and the Frequently Used Special Provision for "Embedded Galvanic Anodes" for more guidance.

Descriptions for pay items associated with this work can be found in the Standard Specifications for Construction. Some of those items are listed below:

- Deck Joint, Remove [Foot]
- False Decking [Square Foot]
- Expansion Joint Device [Foot]
- Concrete, Grade D [Cubic Yard]
- Reinforcement, Steel, Epoxy Coated [Pounds]
- Embedded Galvanic Anode [Each]

For False Decking, include a note on the plans that reads "False decking limits shall be 2'-6" each side of the joint for the entire length of the joint or as defined by the Engineer".

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
RESEALING BRIDGE CONSTRUCTION JOINTS WITH LOW-MODULUS HOT-POURED RUBBER
(Capital Scheduled Maintenance)

REVISED:10-20-05

a. Description. This work consists of removing existing joint sealants, cleaning the joint, and sealing the joint with a low-modulus hot-poured joint sealant.

The location of the joints to be resealed shall be as shown in the proposal or as directed by the Engineer.

All work and materials shall be according to the Standard Specifications with exceptions and additions specified herein.

b. Materials. The hot-poured sealant and backer rod shall be according to Subsections 914.04.A and B of the Standard Specifications.

c. Seal Removal. All existing joint seals shall be removed from the joint grooves. If removing neoprene, the portion of the seal in the vertical joint groove at the barrier or sidewalk need not be removed. For joint grooves that have closed beyond their design limits, it may be necessary to run a single saw cut through the length and depth of the joint seal to relieve the pressure and facilitate removal. Hot-poured sealant and silicone shall be removed by plowing or sawing.

d. Joint Preparation. Immediately prior to sealing, the joint shall be cleaned to remove all dust and contamination from the joint faces and reservoir. The surface of the concrete shall be completely dry at the time of sealing.

Cleaning shall consist of dry abrasive blast cleaning of each joint face, followed by a final cleaning with compressed air free of oil and water and having a minimum pressure of 90 psi. After the final cleaning, the backer rod shall be inserted into the transverse joint groove to the depth shown on the Detail for Resealing Bridge Construction Joints with Low-Modulus Hot-Poured Rubber.

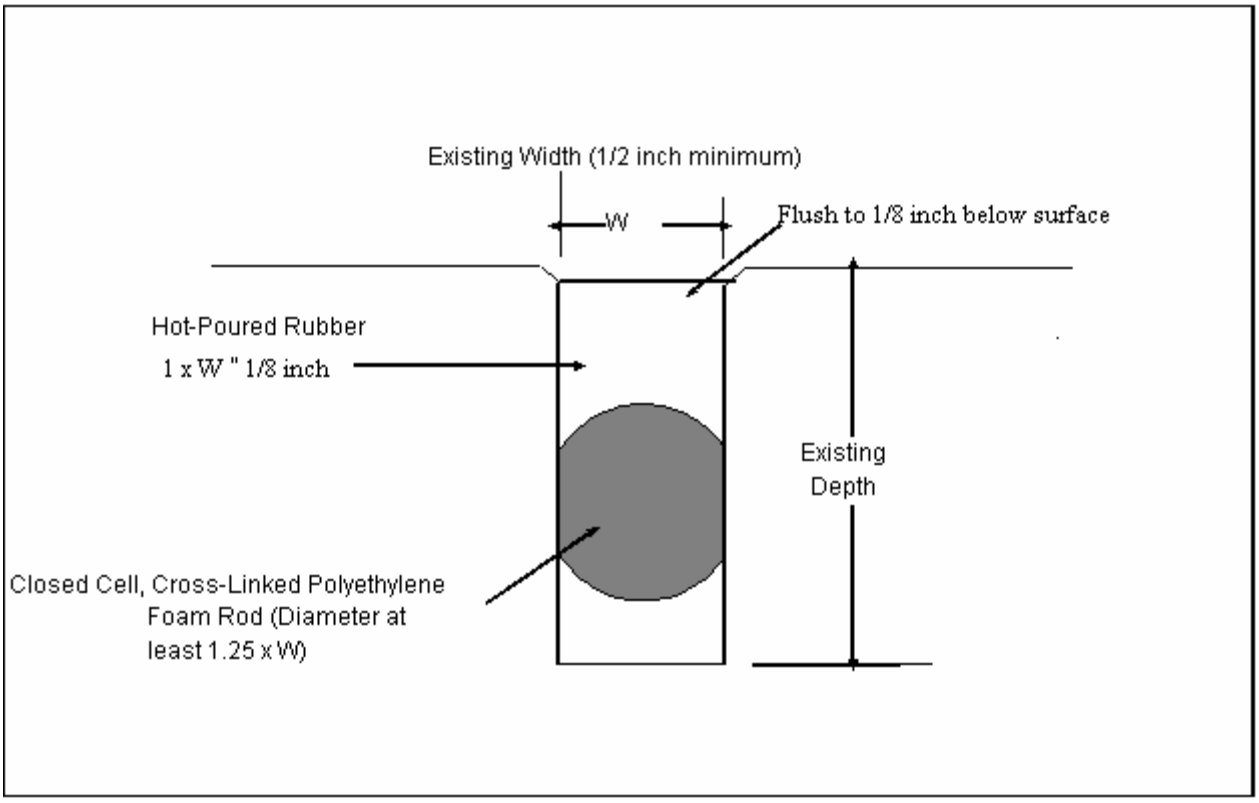
e. Joint Sealing. The joints shall be sealed with the hot-poured sealant as specified in Subsection 602.03.S.4 of the Standard Specifications. The top of the sealant (after cooling) shall be flush to 1/8 inch below the surface of the bridge deck.

f. Measurement and Payment. The completed work as described will be paid for at the contract unit price for the following contract item (pay item):

Contract Item (Pay Item)	**Pay Unit**
Resealing Bridge Construction Joints	Feet

Resealing Bridge Construction Joints includes all labor, equipment, and materials required to remove all existing sealants, clean the joint, and reseal the joints. The Hot-Poured Rubber used to reseal the joints shall be included in the above contract unit price.

Detail For Resealing Bridge Construction Joints With
Low-Modulus Hot-Poured Rubber



Chapter 8

CONCRETE COATING / SEALING

The purpose of concrete sealing is to slow water intrusion into the concrete and therefore better protect the steel reinforcement. It is important to note that each of these materials requires that the concrete cure for a minimum of 28 days prior to sealing. This constraint can become the critical path in a concrete patching and sealing contract.

There are three different materials used for concrete sealing, as outlined in the paragraphs below.

A. PENETRATING WATER REPELLENT TREATMENT

This is a standard pay item described in Subsection 706.03.S of the MDOT Standard Specifications for Construction.

This is a clear sealer with the consistency of water that provides a level of water repellency to horizontal and vertical concrete surfaces. Typically it is used on the vertical surface of substructure units, or concrete fascia beams, but can also be applied to deck surfaces that are relatively new and may need the protection of a water sealant. It may also be used on the top, horizontal surface of a substructure if there is no deck joint directly above. Penetrating Water Repellant Treatment offers no aesthetic value, so should only be used where aesthetics are not important.

All concrete to be sealed must be at least 28 days old. The surface of the concrete to be sealed is to be prepared using high pressure power washing or, for a relatively new deck surface, sandblasted to remove curing compound. Once the surface has dried, the material is applied using rollers. When used on the deck surface, the curing time of penetrating water repellent treatment is estimated to be 4 hours (before re-opening to traffic).

Measure the surface area and enter the quantity on the CSM estimating sheet. The unit price includes the surface preparation and the application of the material.

Pay Item: Water Repellent Treatment, Penetrating [Square Yard]

B. Substructure Horizontal Surface Sealer – See the following Special Provision:

SUBSTRUCTURE CONCRETE SEALERS, HORIZONTAL SURFACE

This material is an opaque, epoxy sealer that offers a nearly impenetrable barrier. It is used to provide a sealed surface on the top horizontal surface of pier caps or abutments that have a joint above. This material is not appropriate for a deck surface and should not be applied to substructure units where there is no joint above it, such as on pier caps of structures with pin & hangers or continuous spans.

This material should not be used to encapsulate the entire substructure unit as it does not "breathe" and can cause concrete degradation in such instances. It is also unsightly and should not be used in visible locations. Care should be taken to prevent the sealer from running beyond the edge of a horizontal surface and down a visible vertical face, such as the sides of a pier cap. It may be used on the vertical surface of an inconspicuous abutment backwall with slight modifications to the special provision.

All concrete to be sealed must be at least 28 days old. The surface is to be prepared by using a light abrasive blasting and the material is then applied using the manufacturer's recommendations.

Measure the surface area and enter the quantity on the CSM estimating sheet. The unit price includes the surface preparation and the application of the material.

Payment for this item is by lump sum. Note that an **informational quantity must be provided** in the proposal for the contractor to estimate the lump sum bid amount.

Pay Item: Substructure Horizontal Surface Sealer *(structure #)* [Lump Sum]

C. Concrete Surface Coatings – See the following Special Provision:

CONCRETE SURFACE COATINGS

This material is an elastomeric sealer that provides a rubberized coating to the concrete. It can be used to seal all surfaces of concrete except traffic bearing surfaces. Besides sealing, it creates a uniform color and texture, and is recommended for use in areas where aesthetics are important.

Elastomeric coatings are often used to provide a uniform appearance to concrete elements that have been patched. A light concrete gray color is often selected to blend in with surrounding unsealed structural concrete, but other colors are available. Before selecting an original color, a consultation with Lynn Lynwood in the Roadside Development unit of the Design Division is recommended. Many Regions and TSCs have developed color schemes for specific corridors to maintain aesthetic continuity. It is highly recommended that the Contractor be required to provide a coating test section so the Engineer can review and approve the color prior to application on the structure.

Concrete Surface Coatings are typically used on the vertical surfaces of substructure units, retaining walls, concrete fascia beams, concrete bridge barrier railing, and deck slab fascia. The treatment lasts longer than five years, but once coated the concrete elements must be kept coated.

All concrete to be sealed must be at least 28 days old. The surface must be carefully prepped by using a light abrasive blasting. The material is then applied using the manufacturer's recommendations.

Measure the surface area and enter the quantity on the CSM estimating sheet. The unit price includes the surface preparation and the application of the material.

Payment for this item is by lump sum. Note that an **informational quantity must be provided** in the proposal for the contractor to estimate the lump sum bid amount.

Pay Item: Conc Surface Coating (*structure #*) [Lump Sum]

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
SUBSTRUCTURE CONCRETE SEALERS
HORIZONTAL SURFACE

REVISED:10-11-05

a. Description. This specification covers requirements for and application of penetrating epoxy resin based concrete sealers to be used for coating the top horizontal surface of concrete pier caps, abutment bridge seats, and other locations as specified on the plans. The Standard Specifications for Construction shall apply except as modified herein.

b. Materials. The qualified for use two-component epoxy penetrating concrete sealers are:

Company / Product	Phone No.
Polycarb / Mark 124	800-225-5649
Master Builders / Masterseal GP	800-924-6400
E-Bond / E-Bond 120	954-566-6555
Conspec / Spec-seal	800-348-7351
Tamms / Dural 333 (Federal color gray #16376)	734-667-3338
Unitex / Pro-Poxy 200T (Federal color gray #16376)	800-821-5846

c. Construction Methods. Surface preparation and application shall be according to manufacturer's recommendations, except as modified by this specification.

1. **Surface Preparation.** All concrete to be sealed must be at least 28 days old. All surfaces to receive the concrete sealer shall be dry and free from contamination such as oil, grease, latence, and curing compounds. Light abrasive blasting followed by oil-free compressed air cleaning is required. Water blasting or wire brushing is not permitted.

2. **Application.** Application shall be according to manufacturer's recommendations. Two coats of sealer, at the manufacturer's recommended application rate, are required.

d. Measurement and Payment. The completed work as described will be paid for at the contract unit price for the following contract item (pay item):

Contract Item (Pay Item)	**Pay Unit**
Substructure Horizontal Surface Sealer (Structure Number)	Lump Sum

Payment for **Substructure Horizontal Surface Sealer (Structure Number)** includes all labor, equipment, and materials to prepare the substrate concrete surface and apply two coats of sealer according to this specification. No compensation will be made to the Contractor for surplus materials.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
CONCRETE SURFACE COATINGS

a. Description. Furnish and apply an acrylic based concrete surface coating to concrete structures, including but not limited to barriers, fascias, cheekwalls, piers and substructure locations as specified on the plans. Conform to the Standard Specifications for Construction except as modified herein.

b. Materials. Select the acrylic based concrete surface coating from the list of products listed below. On any single structure, use the same product for all areas to be coated with a specified color. Do not mix colors or products from more than one source.

For this project, furnish and apply a smooth textured, **(NOTE TO DESIGNER: INSERT PROJECT SPECIFIC COLOR HERE)** or other colors as approved by the Engineer

Submit color samples to the Engineer for review and approval. If required by the Engineer, complete a test section to demonstrate the final color prior to application of the coating to the structure.

Company	Product
Carboline Company	Carbocrylic 600
ChemMasters	Colorcoat
ChemMasters	Colorlastic
Conspec	Permacoat
ICI Dulux Paints	Decra-Flex 300
Sika Corporation	Elastocolor
Sika Corporation	Sikagard 550W Elastic
Sonneborn	Super Color Coat
Tamms Industries	Tammolastic
Thoro	Thorocoat
Thoro	Thorolastic

c. Construction.

1. **Surface Preparation –** All concrete to be coated must be tested for the presence of moisture after surface preparation has been completed and prior to application of the coating. Testing shall be in accordance with ASTM D4263. A 2’ x 2’ sheet (4mil) of transparent polyethylene shall be taped to the concrete surface to be coated. All edges will be sealed with tape that will stick to the concrete substrate and not allow the infiltration of air. The plastic sheet will be left in place a minimum of two hours to detect the presence of moisture in the concrete. There shall be no moisture visible on the polyethylene sheet after the minimum period of time has elapsed. This will be verified by the Engineer before application of the coating begins. Alternate methods to detect moisture shall be approved

by the Engineer. This test should be performed a minimum of once every 100 feet on barriers, walls etc., and a minimum of once on columns, piers, etc. Prepare the surface, including removing fins and projections and filling surface voids and cracks (if required), according to manufacturer's recommendations, except as modified by this specification.

The surface to be coated must be dry and free from all contamination including, but not limited to, dirt, form release agents, oil, grease, laitance, loose material and curing compounds. Clean surface by low-pressure water cleaning, steam cleaning, or abrasive blasting (followed by oil-free compressed air cleaning) or by combination to achieve an acceptable cleaned surface. When low-pressure water cleaning, or steam cleaning are used, the concrete surface profile (CSP) shall be CSP 1 in accordance with the International Concrete Repair Institute Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays (Guideline No. 03732). When abrasive blasting is used, the concrete surface profile shall be CSP 3. Low-pressure water or steam–cleaning primarily removes water soluble contaminants. Aged concrete with contaminants such as hardened curing compound may require light abrasive blasting to completely remove the curing compound. Since many curing compounds contain wax, even well adhered residue shall be removed prior to coating to ensure a good bond between the surface coating and the concrete.

When low pressure water cleaning, or steam cleaning is used, the power washer must deliver 3000 - 4500 psi and utilize a 15E or smaller nozzle tip held perpendicular to the surface being cleaned. When using light abrasive blasting to remove contaminants on new construction, be careful not to remove excessive concrete material.

2. **Visual Inspection –** Check surface cleanliness by lightly rubbing with a dark cloth or by pressing translucent adhesive tape onto the concrete surface in the presence of the Engineer. An acceptable level of residual dust can be agreed upon by the Engineer and the contractor. Perform a water drop test in the presence of the Engineer prior to coating the concrete surface to detect for the presence of any hydrophobic contaminants. Hydrophobic contaminants include materials such as form release agents, curing compounds, oil, grease, wax, and resins. If contaminants are detected, as evidenced by a lack of rapid absorption of the water drop into the concrete, remove the contaminants and perform the tests again until no contaminants are detected.

3. **Application -** Apply two coats of the acrylic based concrete surface coating. Apply each coat to provide the minimum wet film thickness as recommended by the manufacturer.

d. Measurement and Payment. The completed work as described will be paid for at the contract unit price for the following contract item (pay item):

Contract Item (Pay Item)	**Pay Unit**
Concrete Surface Coating (Structure No.)	Lump Sum

Payment for **Concrete Surface Coating (Structure No.)** includes all labor, equipment, and materials necessary to prepare the substrate concrete surface, conduct the visual inspection and apply the primer (if required) and two top coats of surface coating. No additional payment will be made for the test section.

Chapter 9

MINOR CONCRETE PATCHING AND REPAIR

The purpose of this work activity is to fix those areas on the deck which if left unattended could cause deterioration to other components such as around joints and deck drains. This is not intended for patching areas in the general surface of the deck unless there is evidence that one small area of the deck is unique from the rest of the deck and that patching of this area will prevent deterioration of another component.

For small deck repairs, see the Special Provision and usage statement provided for "Bridge Deck Surface Repair". Larger deck repairs, isolated areas of substructure deterioration, and minor spalls in concrete railing or beams may also be patched as part of CSM work. See Section 703 of the MDOT Standard Specifications for Construction for appropriate application of standard concrete patching mixtures.

Measure the surface area to be patched and enter this quantity on the CSM cost estimate sheet for the appropriate patching mixture. Add a similar quantity for hand chipping and patch forming, if necessary.

A. Bridge Deck Surface Repair (with hydraulic fast set mortar) -
See the following Special Provision:

CONCRETE BRIDGE DECK INTERMEDIATE SURFACE REPAIR

This special provision is applicable only for deck patching, when the maximum surface area included within the limits of an individual repair does not exceed 5 square feet. The maximum depth of repair shall not exceed 4 inches. This is a fast set mortar, and the cure time required before opening to traffic is much less than for latex modified concrete.

Pay Item: Bridge Deck Surface Repair [Square Yard]

B. Standard Concrete Patching Mixtures

See Section 703.01.B and Table 703-1 of the MDOT Standard Specifications for Construction for the appropriate use of various standard concrete patching mixtures. These concrete mix pay items are appropriate for larger deck patches, pier or abutment repairs, repairs to concrete barrier railing or concrete beams, or other repairs that require patch forming.

See also the following Special Provision:

STRUCTURE REPAIR WITH LATEX MODIFIED CONCRETE – SPECIAL

This Special Provision is applicable for small quantities (1-2 cubic yards) of C-L concrete mix. It allows for the use of an on-site portable drum mixer and is paid for as lump sum instead of cubic yards.

Pay Item: Patching Concrete, (Type C-L) - Special [Lump Sum]

Descriptions for other pay items associated with this type of work can be found in the MDOT Standard Specifications for Construction. Some of those items are listed below:

- Hand Chipping, Deep [Square Yard]
- Hand Chipping, Shallow [Square Yard]
- Hand Chipping, Other Than Deck [Cubic Foot]
- Patch, Forming [Square Foot]
- Patching Concrete, C-L [Cubic Yard]
- Patching Concrete, C-L-HE* [Cubic Yard]
- Patching Concrete, C [Cubic Yard]
- Patching Concrete, C-HE* [Cubic Yard]

** Note – High Early Strength (HE) concrete is not recommended unless shorter cure time is absolutely necessary. Under no circumstances should HE concrete be used for concrete beam repair.*

Summary of Patching Mix Usage:

Bridge Deck Surface Repair (SP required)	Deck patches less than 5 sft Depth less than 4" Fast set mortar
*Patching Concrete C-L	Deck patches greater than 5 sft Superstruct. or substruct. patches Depth 1.5" or more 5 day min cure time
Patching Concrete C-L-HE*	24 hour min cure time
Patching Concrete, (Type C-L) – Special (SP required)	96 hour min cure time
Patching Concrete C	Substructure patches Depth greater than 4" 5 day min cure time
Patching Concrete C-HE*	24 hour min cure time

**Note - Most superstructure and substructure repairs use Patching Concrete C-L.*

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
CONCRETE BRIDGE DECK
INTERMEDIATE SURFACE REPAIR

REVISED:03-03-06

a. Description.-This work shall consist of repairing bridge deck spalls at locations sounded and outlined by the Engineer, not adjacent to joints in the surface, using prepackaged hydraulic fast set mortar. All work shall be according to the Standard Specifications for Construction, except as modified herein.

b. Materials.-The prepackaged hydraulic fast set repair mortar shall be selected from the Department's Qualified Products List for Prepackaged Hydraulic Fast Set Patching.

The patching mixture must be extended with aggregate if the average depth of the repair exceeds 2 inches, and the surface area of the repair exceeds 1.0 square foot. The maximum aggregate extension rate shall not exceed the limits specified on the Qualified Product's List. Aggregates shall be natural aggregates from MDOT approved sources, and shall be the type, size, and gradation recommended by the manufacturer of the prepackaged fast set mortar.

c. Equipment.-The chipping hammers used to prepare the repair area shall be light weight (35 lb Class, maximum), unless otherwise approved by the Engineer.

Mixers for mixing the prepackaged hydraulic fast set mortar shall be a paddle type mortar mixer.

d. Construction Methods.-The maximum surface area included within the limits of an individual repair should not exceed 5.0 square feet. The maximum depth of repair shall not exceed 4 inches.

1. Repair Area Preparation.-Repair areas shall be sounded and outlined by the Engineer using an appropriate steel hammering device to ensure thorough detection of all unsound areas. Requirements for saw cutting the perimeter of the repair shall be as specified by the manufacturer of the prepackaged fast set patching mortar.

All unsound concrete and bituminous patching material shall be removed from the repair area with chipping hammers. All surfaces of the repair area shall then be sounded using an appropriate steel hammering device to ensure thorough detection, and thus complete removal of all unsound materials. Exposed reinforcing steel shall be removed

flush with the sound concrete surface. All surfaces of the repair area shall then be sandblasted to remove all contamination, followed by a final cleaning with oil-free compressed air having a minimum pressure of 90 psi.

2. Mortar Placement.-The mortar shall be mixed, placed, consolidated, finished and cured as specified by the manufacturer of the prepackaged fast set mortar.

3. Opening to Traffic.-The cure time required for opening to vehicular traffic shall be as specified by the manufacturer of the prepackaged fast set mortar and in accordance with the Maintaining Traffic Requirements for this contract.

e. Measurement and Payment.- The completed work as described will be paid for at the contract unit price for the following contract item (pay item):

Contract Item (Pay Item)	**Pay Unit**
Bridge Deck Surface Repair…….. …….	Square Yards

Payment for **Bridge Deck Surface Repair** includes all material, labor, and equipment required to prepare, place, consolidate, finish, and cure the prepackaged hydraulic fast set patching mortar according to this special provision.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
STRUCTURE REPAIR WITH LATEX MODIFIED CONCRETE – SPECIAL

REVISED: 05-11-04

a. Description.-This work consists of furnishing and placing latex modified concrete to repair the prepared portion of bridge substructure and/or superstructure. All work shall be according to the Standard Specifications for Construction, except as modified herein.

b. Materials.-The materials will meet the requirements specified in the designated section of the Standard Specifications for Construction. The concrete patching mixture will be Type C-L as specified in Table 703-1 of the Standard Specifications for Construction.

c. Equipment.-The Contractor will supply latex modified concrete that has been prepared in a continuous mixer (mobile mixer).

Equipment for producing concrete by continuous mixing will conform to ASTM C 685. The Contractor will be required to demonstrate that the equipment is properly calibrated for yield and proportions by certification or by field tests. Use of this equipment will be permitted provided that a satisfactory product is obtained as determined by the Engineer.

For small quantities, the Engineer may permit the use of an on-site portable drum mixer to produce the concrete mixture. In this case, all materials shall be individually proportioned by weight according to the repair concrete mix requirements included in this specification. Prior to placing concrete, the Contractor must demonstrate to the satisfaction of the Engineer that the proposed batching and mixing protocol will produce the concrete mixture conforming to specification requirements.

The Contractor will supply hand held vibrating equipment capable of consolidating the repair concrete.

d. Construction Methods.- Mixing, placing, finishing, and curing concrete patches will be according to Subsection 712.03.O of the Standard Specifications for Construction, except as modified below.

No more than 48 hours will elapse from time of air blast cleaning of substrate to placement of repair concrete. The substrate will be clean and free of dust, laitance, and other loose material.

The patch concrete will be placed and vibrated within forms in uniform layers.

Immediately after finishing the concrete, apply a layer of wet burlap to the exposed concrete surface. This burlap will be soaked in water for a minimum of 12 hours prior to its use. Place plastic sheeting securely over the burlap to protect the top surfaces from evaporation. For a minimum of the first 48 hours, the concrete will be kept continuously damp by the curing system. Concrete forms and wet burlap will serve to wet cure the concrete and will remain in place for at least 48 hours after placement of the Latex Modified Concrete. After 48 hours of cure, the plastic sheeting, the wet burlap, and concrete forms will be removed. The repair concrete will be allowed to air cure for another 48 hours, for a total of 96 hours of cure.

e. Measurement and Payment.-

Contract Item (Pay Item)	Pay Unit
Patching Concrete, (Type C-L) - Special	Lump Sum

Payment for the **Patching Concrete, (Type C-L) - Special** will be lump sum and includes furnishing, placing, consolidating, finishing, and curing (96 hour) the repair concrete with no additional compensation permitted.

Chapter 10

CONCRETE CRACK SEALING

The purpose of this work activity is to seal cracks in the deck that can be expected to go to the depth of the reinforcing steel.

See the following Special Provision:

SEALING LOCALIZED CRACKS IN BRIDGE DECKS

Deck cracks to be sealed must be a minimum of 8 mils wide. Penetration of the material into the crack is by gravity feed. This material is only slightly more viscous than water and will penetrate through if the crack is full depth. It is a highly visible amber-brown color for UV protection, so discretion should be used as to its placement in visually sensitive areas.

The area to be treated is to be prepared by lightly sandblasting and the crack then blown clean with compressed air. The material is to be applied according to the manufacturer's recommendations.

Measure the length of the cracks to be sealed and enter the quantity on the CSM estimating sheet. The unit price includes the preparation and the application of the material.

Pay Item: Crack Sealer [Foot]

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
SEALING LOCALIZED CRACKS IN BRIDGE DECKS
(Capital Scheduled Maintenance)

REVISED:12-07-05

a. Description - This specification covers requirements for sealing localized cracks (a minimum 8 mils in width) in bridge deck surfaces using an epoxy based healer/sealer material. All work shall be according to the Standard Specifications, except as modified herein.

b. Materials - The epoxy based healer/sealer shall be one of the following:

Product	Company
Masterseal GP	Master Builders Inc.
Bridge Seal	Unitex
Sikadur 55 SLV	Sika Corp.
Dural 335	Tamms
E-Bond 120	E-Bond

c. Construction Methods - The localized crack healer/sealer shall be applied at locations determined by the Engineer. Surface preparation and application shall be according to manufacturer's recommendations, except as modified by this specification. The concrete substrate shall be thoroughly dry with no sign of moisture emissions in the cracks.

1. **Surface Preparation -** All areas to be treated with the localized crack healer/sealer shall be lightly sandblasted prior to the application to remove contamination such as dirt, grease, and oils, and to expose the surface of the cracked area to enhance penetration and visibility. All cracks shall then be blown clean with oil-free compressed air.

2. **Application -** Proportioning and mixing the localized crack healer/sealer materials shall be according to manufacturer's recommendations. Application of the localized crack healer/sealer shall be performed using a squeeze bottle with a tip opening configuration sufficient to continually apply the epoxy healer/sealer to the crack, thus resulting in no greater than a 1-inch overband onto the deck surface. The Contractor shall visually demonstrate, to the satisfaction of the Engineer, that the healer/sealer is being applied with

sufficient quantity to ensure penetration of the material into the crack by gravity feed. Any spillage or application over the 1-inch overband width shall be immediately removed, prior to set, to the satisfaction of the Engineer.

d. Measurement and Payment - The completed work as described will be paid for at the contract unit price for the following contract item (pay item):

Contract Item (Pay Item)	**Pay Unit**
Crack Sealer	Foot

Measurement and payment for **Crack Sealer** will be based on the length of cracks sealed and includes all labor, equipment and materials necessary to complete the work.

Chapter 11

APPROACH PAVEMENT RELIEF JOINTS

The purpose of this work activity is to provide pressure relief joints in the concrete pavement at the bridge approach. It is recommended that Approach Pavement Relief Joint details be prepared with the assistance of a bridge or road design unit.

Ordinarily, the best location for a pavement relief joint is beyond the first approach pavement joint and preferably half way between the next two transverse joints. Avoid creating a narrow, discontinuous pavement slab that may eventually "rock".

There are at least three options in providing a pressure relief joint in approach pavement, depending on the width of joint required. The width of the sawcut for the joint is determined by the amount of pressure to be relieved - use engineering judgment. One wider joint (see option 3) is preferable to a series of narrower joints. The sawcut must be made completely through the concrete pavement thickness for the joint to function as intended. Place a note on the plans specifying that payment for the sawcut is included in payment for the joint.

See Special Detail R-44-C and Section 603 of the MDOT Standard Specifications for Construction.

A. **Option 1** - width of joint is 1"
Use the "Erg Expansion Joint" detail from Special Detail R-44-C, sheet 2 of 5.

- Joint, Expansion, Erg [Foot]

This is a standard pay item covered in the Standard Specifications for Construction.

B. **Option 2** - width of joint ~4"
See the following Special Provision:

APPROACH PAVEMENT JOINTS

Use the "Pressure Relief Joint" detail from Special Detail R-44-C, sheet 5 of 5.

Pay Item: Joint, Pressure Relief, 4 inch [Foot]

C. **Option 3** - width of joint 8"-12" or wider*
Sawcut and fill full depth with bituminous asphalt.
(*Must be wide enough to get bituminous properly compacted.)
Seek assistance from Design regarding pay item.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
APPROACH PAVEMENT JOINTS

DES:JAG 1 of 1 C&T:APPR:JFS:MJE:09-21-05

a. Description. The purpose of this work is to provide pressure relief joints in the concrete pavement at the bridge approach. Perform this work in accordance with the Sections 602 and 603 of the Standard Specifications for Construction except as modified herein.

b. Materials. Joint filler shall be cellular polyurethane designed for pressure relief joints in concrete pavements and conform to the requirements of ASTM D 3204, and exhibit the following typical properties:

Average Density	7 - 10 pounds per cubic foot
Weight per foot	1.625 - 2.0 pounds
Compressive Strength, psi, ASTM D3574 And ASTM D 1056	
At 25% deflection	5 ± 2
At 65% deflection	12 ± 4
Recovery, %min, ASTM D2406	90
Water Absorption, AASHTO T-42	30% void Max

Materials supplied shall be new Tamms Flex Lok® or approved equal.

c. Construction. Extend saw cut through the underlying Portland cement concrete as shown on the plans. Construct all relief joints to the limits and dimensions shown on the plans and installation requirements of the joint filler manufacturer as approved by the Engineer.

d. Measurement and Payment. The completed work as described will be paid for at the contract unit price for the following contract item (pay item):

Contract Item (Pay Item)	**Pay Unit**
Joint, Pressure Relief, 4 inch	Foot

Payment for **Approach Pavement Joints** includes all materials, equipment, and labor necessary to complete the work according to this special provision. The length of **Approach Pavement Joints** will be measured and paid for in linear feet.

Chapter 12

SLOPE PROTECTION REPAIR

The purpose of this work activity is to repair or replace spot locations of failed or damaged slope protection.

See Standard Plan B-102-C "Standard Slope Paving Details" and Sections 205, 206, 712 and 813 of the MDOT Standard Specifications for Construction.

A detail showing the limits of slope protection to be removed and replaced is to be provided with the design package. The slope protection needing repair shall be replaced in kind, and riprap already at the site shall be salvaged and reused when appropriate.

Removal of the damaged slope paving or unusable riprap shall be paid for as Structures, Rehabilitation, Rem Portions (*structure #*). The portion of slope paving or riprap to be removed is to be measured in cubic yards, and then entered on the CSM estimating sheet to determine the cost of removal (to be bid by the contractor as "lump sum"). This same quantity, in cubic yards, should be called out on the plans as an informational quantity for the contractor.

NOTE - the "as built" quantity for removal, fill, and slope protection usually ends up being twice the amount initially measured in the field. Therefore, consider doubling the field measured quantity for the cost estimate.

Voids up to 12 inches deep shall be filled with Structure Embankment, CIP. Voids deeper than 12 inches shall be filled with Structure Backfill, CIP. This must be identified on the plans.

Slope Paving Headers, if needed, will be paid for separately, while payment for riprap headers is included in the item for Riprap. Geotextile liner is also included in the pay item for Riprap.

Descriptions for pay items associated with this type of work can be found in the Standard Specifications for Construction. Some of those items are listed below:

- Slope Paving, Concrete [Square Yard]
- Slope Paving, Precast Concrete [Square Yard]
- Slope Paving Header [Foot]
- Riprap, Grouted [Square Yard]
- Riprap, Plain [Square Yard]
- Riprap, Heavy [Square Yard]
- Embankment, Structure, CIP [Cubic Yard]
- Backfill, Structure, CIP [Cubic Yard]
- Structures, Rehabilitation, Rem Portions (*structure #*) [Lump Sum]

Chapter 13

MAINTAINING TRAFFIC

One of the parameters that sets CSM work apart from CPM work is the short duration of the project, typically one day or less, and therefore the ability to keep the cost and complexity of traffic control to a minimum. Nevertheless, each bridge site will require some form of traffic control and the best resource for that is the Region Traffic and Safety Engineer.

For CSM projects, traffic control may be paid for as LUMP SUM. However, estimated quantities of work items must be provided for informational purposes. A project specific special provision for maintaining traffic must be included in the Proposal, as well as appropriate traffic control Typicals. An example of a special provision for maintaining traffic for a road CPM project, as well as a couple of sample Typicals, are provided at the end of this chapter.

Maintaining Traffic Special Provision (format)

- General
- Construction Influence Area
- Traffic Restrictions
- Construction Staging Guidelines - (if applicable)
- Traffic Control Device
  - ◊ General
  - ◊ Temporary Signs
  - ◊ Channelizing Devices
  - ◊ Temporary and Permanent Pavement Markings
- Measurement and Payment
  - ◊ Pay Item. . . . . Maintaining Traffic . . . . . .Lump Sum
  - ◊ Estimated Quantities - Informational quantities for work items must be provided in the proposal so the contractor can estimate the amount to bid as lump sum. Note: Some Frequently Used Special Provisions for traffic control list pay items separately, which may conflict with the traffic control special provision. Therefore, it is important to add a disclaimer note to the special provision, such as:

Estimated quantities are for informational purposes only. These items will not be paid separately but are included in the pay item Maintaining Traffic. In the event of a conflict between pay items listed in this Maintaining Traffic Special Provision and those on other special provisions, the Maintaining Traffic Special Provision shall govern.

Traffic Control Typicals

Upon consultation with the Region Traffic and Safety Engineer, include the applicable traffic control Typicals in the project proposal. Some examples of Typicals are presented at the end of this chapter.

Estimating

Scoping and design cost estimates for traffic control should come from the Region or TSC Traffic and Safety staff, based on the informational quantities developed.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
MAINTAINING TRAFFIC

GENERAL

Traffic shall be maintained throughout the project in accordance with Section 103.05, 103.06 and 812 of the MDOT Standard Specifications for Construction, including any supplemental specifications, and as herein specified.

The Contractor shall notify the Resident Engineer a minimum of 72 business hours prior to the implementation of any detours, road closures, bridge closures, ramp closures or lane closures and major traffic shifts.

The Contractor shall coordinate his operations with Contractors performing work on other projects within or adjacent to the Construction Influence Area (CIA).

MDOT maintenance crews and/or Contract Maintenance Agencies may perform maintenance work within or adjacent to the Construction Influence Area (CIA). The Maintenance Division of MDOT and/or Contract Maintenance Agency will coordinate their operations with the Engineer to minimize the interference to the Contractor. No additional payment will be made to the Contractor for the joint use of the traffic control items.

CONSTRUCTION INFLUENCE AREA(CIA)

The CIA shall include the right-of-way of the following roadways, within the approximate limits described below:

US-23, in Livingston County, from 2,000 feet north of the RR Bridge (X03 of 47013) to 4,000 feet south of Silver Lake Road. This will include the ramps at Silver Lake Road and Lee Road interchanges. Located in Green Oak Township.

In addition, the CIA shall include the rights-of-way of any intersecting roads adjacent to the work zone for a distance of approximately 500 feet in advance of the state trunkline.

TRAFFIC RESTRICTIONS

No work shall be performed or lane closures allowed during the Memorial Day, Ann Arbor Art Fair, July 4th, or Labor Day holiday periods, as defined by the Engineer.

The contractor shall not be permitted to have a "full width roadway" closure at any time on mainline US-23.

The contractor may close one lane per direction on US-23 from Monday morning at 6am to Friday afternoon at 3pm. Work on weekends only as approved by the Engineer. These closures must follow Typical M57e and use lighted plastic drums with high intensity sheeting. Posted speeds for this closure to be 50 mph, stepped down in 10 mph increments. Night work on mainline to be as directed by the Engineer.

Shoulder closures on US-23 to follow Typical M68e and use lighted plastic drums with high intensity sheeting.

The US-23 ramp work to Lee Road and Silver Lake Road to be done at night with a total closure, as per Typical M47e. The hours of night work are defined as Monday evening 8pm-6am to Thursday evening 8pm-6am. Two (2) Changeable Message boards have been included for this work. Closure of ramps in one direction only and at only one of the interchanges at a time. Ramp work to be in conjunction with mainline closure.

Typical M44e and M48e address the traffic control needed when a mainline lane is closed and the ramp is open to traffic. All active ramp work to be milled and completed in one-night closure.

No conflicting lane closure shall be permitted on any one roadway (all lane closures must originate from the same side of the road). Only one lane closure per direction is permitted.

The contractor shall notify the Engineer at least 24 hours in advance of erection or removal of overlays on existing signs.

When lane closures are in place, the contractor shall completely cover all conflicting warning, regulatory, and guide signs. The sign covers shall be in accordance with 812.03 of the Standard Specifications for Construction.

Storage of equipment or materials on the shoulder shall not be permitted. Storage of equipment within the right-of-way and outside of the clear zone shall be at the discretion of the Engineer.

The workman's private vehicles may be parked within the project limits in areas designated by the Engineer. Access for construction vehicles between the travel lanes and work areas will be restricted to specific locations. The number of access points and their locations will require the prior approval of the Engineer.

TRAFFIC CONTROL DEVICES

General

All traffic control devices and their usage shall conform to the Michigan Manual of Uniform Traffic

Control Devices (MMUTCD), current edition as revised, and as specified herein.

Attached to this provision are Traffic Control Typicals M1e, M44e, M47e, M48e and M57e, and M68e. These typicals shall be used for all lane closures. The signing for the single lane closure shall be as shown in Typical M57e. The signing for entrance and exit ramps shall be as shown in Typical M44e and M48e respectively, ramp closure shall be as shown in Typical M47e.

Tables for “D”, “B” and “L” values are shown on attached Typical M1e.

Temporary Signs

For lane closures, traffic shall be maintained using traffic control devices placed similarly as shown in Typical M57e in the proposal.

“TRAFFIC FINES DOUBLED IN WORK ZONES” signs (as shown in Typical M57e) shall be placed on US-23 on each side of the road 700 feet beyond the W21-4(“ROAD WORK AHEAD”) signs.

All temporary signs shall be faced with prismatic Retro reflective sheeting unless otherwise noted.

All diamond-shaped warning signs shall be 48" x 48" mounted at a 5 feet minimum bottom height.

All temporary warning, regulatory, and guide signs not required for that particular lane closure, shall be either removed, completely covered, or laid down with legs off as directed by the Engineer.

Distances shown between construction warning, regulatory and guide signs shown on the typicals are approximate and may require field adjustment, as directed by the Engineer.

The contractor shall place W21-4 signs (“ROAD WORK AHEAD”), 48" x 48", on all ramps within the lane or shoulder closure area where construction activities may be encountered.

Static signs (four) shown in Advanced Construction Signing Typical to be placed on eastbound and westbound I-96 and northbound and southbound US-23 two weeks prior to scheduled lane closures. Signs to be black on orange and have the following information “US-23 Construction Silver Lake Rd to I-96 Monday-Friday” as shown on Typical. This work is included in the pay item for Maintaining Traffic.

All temporary signs shall be constructed with legends and symbols flush to the signs face and not extending beyond the sign borders or edges.

Fabrication, installation and removal of temporary overlays to be affixed to existing signs shall be the responsibility of the Contractor and shall be included in the pay item for Maintaining Traffic. Fastening devices such as nails, staples, screws or adhesive materials shall not be applied in direct contact with the reflective sheeting.

Channelizing Devices

Lighted plastic drums with high intensity sheeting shall be used for all closures.

Type C Lighted Arrow Panels shall be used where lighted arrow panels are called for and located at the beginning of the taper unless physical limitations restrict its placement. The Lighted Arrow Panel shall then be located as near as possible to the beginning of the taper.

Spacing of channelizing devices shall be 50 feet on tangent sections, 25 feet on shifts and tapers, and 10 feet where tighter control is required by the Engineer.

All channelizing devices used within a construction sequence, i.e., lane closure, shoulder closure, etc. on this project, shall be the same type of device. No intermixing of different types of channelizing devices will be allowed within a construction sequence on this project.

Temporary and Permanent Pavement Markings

Temporary pavement marking shall consist of:

4" white Type R Temporary Pavement Marking
4" yellow Type R Temporary Pavement Marking
4" white Type NR Temporary Pavement Marking (mainline only)
4" yellow Type NR Temporary Pavement Marking (mainline only)

Placement of temporary pavement markers shall be conducted inside a lane closure. The markers shall be spaced at 50 feet along the centerline and shall be as specified in the Materials Sampling Guide, Qualified Products List. Lane lines and edge lines are 4 inch solid stripes.

All existing longitudinal pavement markings that are removed for traffic control or obliterated during construction operations shall be replaced with 4 inch yellow or 4 inch white Waterborne Pavement Marking. Permanent pavement markings shall be a part of this contract and shall be waterborne paint for lane lines and edge lines.

MEASUREMENT AND PAYMENT

The estimate of quantities for maintaining traffic is based on signing and related traffic control devices for single lane closures.

No additional compensation will be paid for contractor delay on construction and coordination of their operations due to traffic maintenance conflicts with other construction projects except for

adjusted unit prices for pay items required during authorized extensions of contract time.

Delays on construction and coordination of their operations due to traffic maintenance conflicts with other construction projects will be considered as a basis for extension of contract time, but will not be considered a basis for extra compensation for suspensions of work, idled equipment, or labor.

Contract Item (Pay Item)	**Pay Unit**
Maintaining Traffic	**Lump Sum**

The estimate of quantities for maintaining traffic is based on signing and related traffic control devices for two-single lane closures.

Any additional signing or maintaining traffic devices required to expedite the construction shall be at the Contractor's expense

Estimated Quantities*

Minor Traffic Devices	1	lump sum
Lighted Arrow, Type C, Furn	2	each
Lighted Arrow, Type C, Operated	2	each
Plastic Drum with High Intensity Sheeting, Lighted-Furnished	1140	each
Plastic Drum with High Intensity Sheeting, Lighted-Operated	1100	each
Barricade, Type III, Lighted, Furnished	4	each
Barricade, Type III, Lighted, Operated	4	each
Sign, Type A, Temp	130	sft
Sign, Type B, Temp	750	sft
Sign Covers	16	each
Sign, Portable, Changeable, Furn	2	each
Sign, Portable, Changeable, Oper	2	each
Pavt Mrkg, Type R, 4" White, Temp	1640	ft
Pavt Mrkg, Type R, 4" Yellow, Temp	985	ft
Pavt Mrkg, Type NR, Paint, 4" White, Temp	985	ft
Pavt Mrkg, Type NR, Paint, 4" Yellow, Temp	650	ft

*These quantities are for informational purposes only. They shall be included in the pay item Maintaining Traffic.

Chapter 14

ESTIMATING

The following attachments will assist in estimating Capital Scheduled Maintenance projects:

A. CSM BRIDGE PROJECT COST ESTIMATING FORM

The electronic file for this estimating workbook is available in Excel and includes 30 Bridge Estimate Sheets and a Project Summary. For multiple bridge entries, the information on the Estimate Sheets will be transferred to the Project Summary and totaled. The unit prices have been updated per the bid prices in 2005, as of 2/15/06.

Click here to access the CSM Cost Estimate Workbook in Excel format.

B. TRNS*PORT PAY ITEM CODES

The TRNS*PORT pay code item numbers are listed for the most commonly used pay items for CSM projects. These pay codes have been revised to correspond with the 2003 Standard Specifications for Construction.

CAPITAL SCHEDULED MAINTENANCE
BRIDGE PROJECT COST ESTIMATE

_____REGION FY_____

ENGINEER: DATE: DECK AREA: STRUCTURE NO:
LOCATION: DECK DIM: **XXX-XXXXX**
PRIMARY WORK ACTIVITY: STR. TYPE:

WORK ACTIVITIES		QUANTITY	DIMENSION	UNIT COST	TOTAL
DECK					
Bridge Deck Surface Repair	(deck patching)		SYD	$585.00 /SYD	
Patching Concrete, C-L	(deck or barrier rail patching)		CYD	$800.00 /CYD	
Crack Sealer			FT	$3.85 /FT	
Water Repellant Treatment, Penetrating	(deck surface)		SYD	$13.80 /SYD	
Concrete Surface Coating	(concrete barrier rail, deck slab fascia)		*SYD	$12.00 /SYD	
Resealing Bridge Construction Joints	(hot poured rubber)		FT	$12.00 /FT	
End Header Replacement			FT	$100.00 /FT	
Expansion Joint Device			FT	$143.00 /FT	
Concrete, Grade D			CYD	$800.00 /CYD	
Reinforcement, Steel, Epoxy Coated			LBS	$1.25 /LB	
Adhesive Anchoring of Horiz. Bars __"			EA	$17.00 /EA	
Drain Casting, Type 1			EA	$600.00 /EA	
Drain Casting, Type 2			EA	$800.00 /EA	
Drain Casting Assembly, Type 1			EA	$850.00 /EA	
Drain Casting Assembly, Type 2			EA	$1,000.00 /EA	
Deck Drain , Extension			EA	$450.00 /EA	
Downspout Replacement			EA	$2,000.00 /EA	
PVC Downspout			EA	$2,500.00 /EA	
PE End Header Box System			EA	$2,500.00 /EA	
Epoxy Overlay	(usually CPM)		SYD	$35.00 /SYD	
Embedded Galvanic Anode			EA	$24.00 /EA	
Other					
SUPERSTRUCTURE					
Spot Painting	(80% clean, 20% coat)		*SFT	$15.00 /SFT	
Patching Concrete, C-L	(concrete beam patching)		CYD	$800.00 /CYD	
Water Repellent Treatment, Penetrating	(concrete fascia beams)		SYD	$13.80 /SYD	
Concrete Surface Coating	(concrete fascia beams)		*SYD	$12.00 /SYD	
Other					
SUBSTRUCTURE					
Patching Concrete, C-L or C	(substructure patching)		CYD	$800.00 /CYD	
Concrete Surface Coating	(vertical surfaces)		*SYD	$12.00 /SYD	
Substructure Horizontal Surface Sealer	(horizontal surfaces)		*SYD	$17.00 /SYD	
Water Repellent Treatment, Penetrating			SYD	$13.80 /SYD	
Other					
DEMOLITION					
Hand Chipping, Shallow	(~3" deep)		SYD	$125.00 /SYD	
Hand Chipping, Deep	(~6" deep min)		SYD	$180.00 /SYD	
Hand Chipping, Other Than Deck	(vertical & overhead surfaces)		CFT	$65.00 /CFT	
Patch Forming	(vertical & overhead surfaces)		SFT	$28.00 /SFT	
Deck Joint, Remove			FT	$115.00 /FT	
False Decking			SFT	$1.40 /SFT	
Epoxy Overlay, Remove			SYD	$20.00 /SYD	
Structures, Rehabilitation, Rem Portions	(slope protection removal)		*CYD	$200.00 /CYD	
Structures, Rehabilitation, Rem Portions	(drain casting removal)		*EA	$250.00 /EA	
Other					
MISCELLANEOUS					
Joint, Expansion, Erg	(pavement joint)		FT	$11.25 /FT	
Joint, Pressure Relief, 4 inch			FT	$40.00 /FT	
Embankment, Structure, CIP			CYD	$22.00 /CYD	
Backfill, Structure, CIP			CYD	$18.00 /CYD	
Riprap, Grouted			SYD	$75.00 /SYD	
Riprap, Heavy			SYD	$49.00 /SYD	
Riprap, Plain			SYD	$45.00 /SYD	
Slope Paving, Header			FT	$70.00 /FT	
Slope Paving, Concrete			SYD	$68.00 /SYD	
Slope Paving, Precast Concrete			SYD	$55.00 /SYD	
Other					
TRAFFIC CONTROL					
Maintaining Traffic	(from TSC or Region T&S)		LS	LS	
Other					
MOBILIZATION		5 %		$0.00	$0

(DOES NOT INCLUDE PE & CE) **CONSTRUCTION TOTAL** **$0**

* Estimated as SYD, Paid for as LUMP SUM

Rev. 3/6/06

TRNS*PORT PAY ITEM CODES
for
BRIDGE CAPITAL SCHEDULED MAINTENANCE
- FREQUENTLY USED PAY ITEMS -
2003 Spec Book

Code #	Pay Item	Pay Unit
1000001	Mobilization, Max $_____	LS
2050012	Embankment, Structure, CIP	Cyd
2060002	Backfill, Structure, CIP	Cyd
6030021	Joint, Expansion, Erg	Ft
6037001	Joint, Pressure Relief, 4 inch	Ft
7060001	Concrete Grade D	Cyd
7060031	Expansion Joint Device	Ft
7060032	False Decking	Sft
7060035	Reinforcement, Steel, Epoxy Coated	Lbs
7060040	Water Repellant Treatment, Penetrating	Syd
7067051	Substructure Horizontal Surface Sealer *(Str. #)*	LS
7067051	Conc. Surface Coating *(Str. #)*	LS
7120003	Hand Chipping, Shallow	Syd
7120004	Hand Chipping, Deep	Syd
7120007	Hand Chipping, Other Than Deck	Cft
7120017	Patch, Forming	Sft
712xxxx	Adhesive Anchoring of Horiz. Bars, ___"	Ea
7120070	Structures, Rehabilitation, Rem Portions *(Str. #)*	LS
7120071	Deck Joint, Remove	Ft
7120073	End Header Replacement	Ft
7120110	Patching Concrete, C	Cyd

7120112	Patching Concrete, C-L	Cyd
7127001	Crack Sealer	Ft
7127001	Resealing Bridge Construction Joints	Ft
7127011	Bridge Deck Surface Repair	Syd
7127011	Epoxy Overlay	Syd
7127011	Epoxy Overlay, Removal	Syd
7127050	Embedded Galvanic Anode	Ea
7127051	Patching Concrete, (Type C-L) – Special	LS
7157051	Steel Structure, Cleaning, Spot, Type 4 *(Str. #*)	LS
7157051	Steel Structure, Coating, Spot, Type 4 (*Str. #*)	LS
7170001	Drain Casting, Type 1	Ea
7170002	Drain Casting, Type 2	Ea
7170010	Drain Casting Assembly, Type 1	Ea
7170011	Drain Casting Assembly, Type 2	Ea
7170065	Deck Drain, Extension	Ea
7170050	Downspout Replacement	Ea
7177050	PVC Downspout	Ea
7177050	PE End Header Box System	Ea
8127051	Maintaining Traffic	LS
8130001	Riprap, Grouted	Syd
8130005	Riprap, Heavy	Syd
8130010	Riprap, Plain	Syd
8130015	Slope Paving Header	Ft
8130020	Slope Paving, Concrete	Syd
8130025	Slope Paving, Precast Concrete	Syd

Appendix A

THIN EPOXY OVERLAY

Thin epoxy overlay is considered a CPM work activity, but with concurrence from the Bridge Operations Unit in Lansing can be included in bridge CSM projects.

(Notes from discussion with John Staton, Doug Branch, Tom Miller and Anthony Dionise 10/01, updated 12/03):

- Special Provision is called "Thin Epoxy Polymer Bridge Deck Overlay". This is a two-coat system often called a "floodcoat", although floodcoat was at one time a one-coat system.

- Pay Item: miscellaneous item called "Epoxy Overlay", paid for as *Square Yard*.

- When to use: Applicable only when deck has very little deterioration except multiple thin cracks, maybe a few small spalls. It bridges thin cracks and seals the deck well. However, if there are only a few cracks in the deck surface, consider crack sealing instead of thin epoxy overlay.

- How to use: Proper preparation is essential! Follow Special Provision to the letter.

- Thickness: Even with 2 coats it's quite thin (epoxy with stones bonded for friction surface). No approach work needed to transition grade.

- Time for construction: can usually do one lane of a bridge in a day, then shift traffic and do the second lane on day two. Curing can take up to 8 hours (depends on specific product and temperature during application.)

- Can be applied over latex modified concrete, and even over bituminous surfaces as long as properly prepped. (Used on roads for snowmobile crossings).

- Limitations: Do NOT use on decks over side-by-side box beams or stay-in-place forms. This recommendation comes directly from the suppliers and has to do with trapping moisture in the deck.

- Expected Life: A well prepared thin epoxy overlay will last 10-15 years or more. Can then be milled off and either re-applied or hydrodemolish (after milling) for conventional concrete overlay. See special provision for "Removal of Thin Epoxy Polymer Bridge Deck Overlay".

- Cost: Per 2005 average bids (WIRS) - **$35/syd.**

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
THIN EPOXY POLYMER BRIDGE DECK OVERLAY

a. Description. This work shall consist of providing all labor, materials, and equipment for cleaning/preparing entire deck surface and applying a two-coat epoxy overlay.

b. Materials. The epoxy system used to overlay the structure shall be a two component, high solids system. Containers shall be marked clearly **"Part A"** or **"Part B"**. The epoxies that are approved by MDOT for thin overlays are as follows:

Tamms	Flexolith 216	Tamms Industries, Inc. (Steve Allegrina) 46771 Danbridge Plymouth, MI 48170 (800) 218-2667
Unitex	Propoxy Type III DOT	Unitex, Inc. (Jerry Byrne) 3101 Gardner Kansas City, MO 64120 (816) 231-7700
Poly-Carb	Flexogrid Mark - 163	Poly-Carb, Inc. (Bruce Roeder) 33095 Brainbridge Road Cleveland, OH 44139 (440) 248-1223
E-Bond	526-Lo-Mod	Ridgemoor Supply Inc. (Stan Bosscher) 4484 Roger B. Chaffee Dr. Kentwood, MI 49548 616-532-0782
Axson	Akabond 811	Axson North America Inc. (John Maher) 1611 Hults Drive Eaton Rapids, MI 48827 (517) 663-8191

The aggregate shall be angular, having less than 0.2% moisture and free of dirt, clay, asphalt, and other foreign or organic materials. The aggregate shall have a minimum Mohs' hardness of 7. Unless otherwise approved, the aggregate shall be chosen from the following list:

Vendor	Product Gradation	Type
Best Sand Chris Calhoun P.O. Box 87 Chardon, OH 44024 (800) 237-4986 Fax: (216) 285-4109	#612	Quartz
Unimin Corp. Ken Booz P.O. Box 254 Mauricetown, NJ 08329 (800) 257-7034 Fax: (856)327-4107	EP-5 Modified	Quartz
Manufacturers Minerals Co. Jim Adderson 1215 Monster Road Renton, Washington 98055 (425) 228-2120 Fax: (425) 228-2199	BT - 6x10	River Rock
Humble Sand and Gravel, Inc. Mary 800 S. College Road, P.O. Box 217 Picher, Oklahoma 74360 (918) 673-1737 Fax: (918) 673-1749	Size: #7	Chipped Flint

c. Equipment. For the epoxy overlay, the distribution system or distributor shall accurately blend the epoxy resin and hardening agent, and shall uniformly and accurately apply the epoxy materials at the specified rate to the bridge deck in such a manner as to cover 100% of the work area including one inch of the vertical face of curb/barrier. The fine aggregate spreader shall be propelled in such a manner as to uniformly and accurately apply dry aggregate to cover 100% of the epoxy material. The vacuum truck shall be self-propelled.

For hand applications, equipment shall consist of calibrated containers, a paddle type mixer, notched squeegees, and stiff bristle brooms, which are suitable for mixing and applying the epoxy and aggregate.

d. Construction.

Surface Preparation. Before placement of the overlay, the Contractor shall clean the entire deck surface by shotblasting to remove asphaltic material, oils dirt, rubber curing compounds, paint carbonation, laitance, weak surface mortar and other potentially detrimental materials, which may interfere with the bonding or curing of the overlay. Acceptable cleaning is usually achieved by significantly changing the color of the concrete and mortar and beginning to expose course aggregate particles. The prepared deck shall meet the International Concrete Repair Institute Guideline No. 03732, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays, concrete surface profile 7 (CSP 7). Mortar which is sound, and soundly bonded to the course aggregate, must have open pores due to cleaning to

be considered adequate for bond. Traffic paint lines shall be removed and replaced at the completion of the overlay. A vacuum cleaner or oil-free moisture-free air blast shall be used to remove all dust and other loose material. Brooms shall not be used.

The epoxy overlay shall not be placed on concrete deck patches less than 28 days of age. Patching and cleaning operations shall be inspected and approved prior to placing the overlay. Any contamination of the deck, or to intermediate courses, after initial cleaning, shall be removed. Both courses shall be applied within 24 hours following the final cleaning and prior to opening area to traffic. There shall be no visible moisture present on the surface of the concrete at the time of application of the epoxy overlay. A transparent polyethylene sheet (4 mil) shall be taped to the deck in accordance with ASTM D4263. All edges will be sealed with tape that will stick to the concrete substrate. The plastic sheet will be left in place for a minimum of 2 hours to detect the presence of moisture in the deck concrete. Alternate methods to detect moisture must be approved by the Engineer. There shall be no moisture visible on the polyethylene sheet. Compressed air may be used to dry the deck surface providing it is moisture and oil free.

During preparation of the surface, the expansion joints, and any other areas not to be overlayed, shall be protected from damage at all times. The protection shall be removed once the epoxy and aggregate has been applied and prior to initial set. Removing the protection shall be done soon enough to in no way harm the adjacent overlay. Protection shall be applied again prior to the second coat and removed again prior to initial set as to not damage adjacent surfaces. The protection shall meet the approval of the Engineer.

Application. Handling and mixing of the epoxy resin and hardening agent shall be performed in a safe manner to achieve the desired results in accordance with the manufacturer's recommendations for a two-coat system or as directed by the Engineer. Epoxy overlay materials shall not be placed when surface or ambient temperature is less than 50 EF. Epoxy overlay materials also shall not be placed if weather or surface conditions are such that the material cannot be properly handled, placed, and cured within the manufacturer's requirements and specified requirements of traffic control.

The epoxy overlay shall be applied in 2 separate courses in accordance with the manufacturer's recommendation for a two-coat system with the following rate of application. First course shall be no less than 40 ft^2/gal. The second course shall be no less than 20 ft^2/gal.

Application of aggregate to both the first, and second courses shall be of sufficient quantity so the entire surface is covered in excess. No bleed through, or wet spots shall be visible in the overlay.

After the epoxy mixture has been prepared for the overlay, it shall be immediately and uniformly applied to the surface of the bridge deck with a notched squeegee. Epoxy shall not be applied if the ambient air temperature is to fall below 50 EF within 8 hours after application. The dry aggregate shall be applied in such a manner as to cover the epoxy mixture completely within 5 minutes any foot traffic on the epoxy shall be minimized and only done with steel spiked shoes. Spikes shall be similar to steel spikes on golf shoes or as approved by the Engineer. First course applications, which do not receive enough sand shall be removed and replaced. A second course insufficiently sanded may be left in place, but will require additional applications before opening to traffic. Each course of epoxy overlay shall be cured until vacuuming or brooming can be performed without tearing or damaging the surface. Traffic or equipment shall not be permitted on the overlay surface during the curing period. After the first course curing

period, all loose aggregate shall be removed by vacuuming or brooming and the next overlay course applied to completion. The minimum curing periods shall be according to the manufacturer's recommendations, as follows, or as directed by the Engineer.

Anticipated Cure Time (Hours)

Average Temp. of Deck, Epoxy and Aggregate Components, EF.							
Temp Range	60 -	60-65	65-70	70-75	75-80	80-85	85+
1st Course		4	3	2.5	2	1.5	1
2nd Course	***	6.5	5	4	3	3	3

***Second course shall be cured for minimum of 8 hours if the air temperature drops below 60 EF during the curing period, or per the manufacturer's recommendations.

The Contractor shall plan and prosecute the work to provide the minimum curing periods as specified herein, or other longer minimum curing periods as recommended by the manufacturer prior to opening to public or construction traffic, unless otherwise permitted. First course applications shall not be opened to traffic. Any contamination of the first course, prior to application of the second course, detrimental to adhesion of the second course shall be removed from the first course at Contractor's expense.

In the event the Contractor's operation damages or mars the epoxy overlay, the Contractor shall remove the damaged areas and replace the various courses in accordance with this special provision at no additional cost to the Department.

For each batch provided, the Contractor shall provide the Engineer with all records including, but not limited to, the following:

1. batch numbers and sizes
2. location of batches as placed on deck, referenced by stations
3. batch time
4. temperature of air, deck surface, epoxy components, including aggregates
5. loose aggregate removal time
6. time open to traffic

e. Measurement and Payment. The complete work as described will be paid for at the contract unit price for the following contract item (pay item):

Contract Item (Pay Item) **Pay Unit**

Epoxy Overlay……Square Yard

Payment for **Epoxy Overlay** includes all material, labor, and equipment required for cleaning, preparing and applying a two-coat overlay system including miscellaneous clean-up.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
REMOVAL OF THIN EPOXY POLYMER BRIDGE DECK OVERLAY

a. Description. Remove thin epoxy polymer overlays on bridge decks or bridge deck shoulders according to the Standard Specifications for Construction and this special provision.

b. Construction. Remove the existing epoxy overlay by scarifying 3/8 inch depth from the top surface of the epoxy overlay. Minimize damage to the underlying concrete substrate from the milling operation. Remove the epoxy overlay as close as possible to the barrier wall, drain structures, and bridge joints to avoid damage. Hand chip with a maximum 15 pound chipping hammer, hand grinder, scabbler, or other methods approved by the Engineer to remove the epoxy overlay material from around the above mentioned structures. If a new thin epoxy polymer overlay is to be installed, perform all work according to the special provision for **Thin Epoxy Polymer Bridge Deck Overlay.**

c. Measurement and Payment. The completed work as described will be measured and paid for at the contract price for the following contract item (pay item):

Contract Item (Pay Item)	**Pay Unit**
Epoxy Overlay, Removal	Square Yard

Measurement for **Epoxy Overlay, Removal** will be based on actual deck surface area of removal. Payment includes all materials, equipment, and labor necessary to remove and properly dispose of the epoxy polymer overlay as described in this special provision.

Michigan Department
of Transportation
0253 (9/03)

CERTIFICATION & ACCEPTANCE – Type 2

(For Capital Preventive Maintenance, Capital Scheduled Maintenance & Non-Freeway Resurfacing Projects Only - 9/19/03)

Funding | Control Section-Job Numbers (list all) | Project Length | Route Number

Project limits (POB & POE)

Description of Work

Ex. Road/Bridge Cross-Section & Number of Lanes | Prop. Road/Bridge Cross Section & Number of Lanes

Design Speed | Posted Speed | Scheduled Let Date | Proposed Let Date

This certification & acceptance form must be completed for each project. Each line will be completed with either a yes, not applicable (N/A) or initials. The Project Manager will assure, by signature, that the Certification & Acceptance (pages 1-4) is completed prior to submitting the log/proposal to the Specifications and Estimates Unit.

Environmental

(Yes or N/A) **This Project is classified as a Categorical Exclusion. If an Environmental Classification Form 1775 was completed, a copy is attached**. There has been no significant change in scope of work that would require reevaluation of the environmental classification. {Categorical Exclusions that have no work outside the shoulders/curbs or do not require a detour, have no environmental concerns and will not have an Environmental Classification Form 1775 prepared.}

(Yes or N/A) Mitigation measures in the environmental document have been included in plans and proposal. **Attach copies of the mitigation measures that were required in the environmental document.** {Such measures could involve construction, noise, archeological and historic sites, wetlands, floodplain encroachments, etc.} Make sure that an adequate amount of soil erosion control measures have been provided and that they are included in the plans. If not included in the project, indicate reasons for change and acceptance, as proposed.

(Yes or N/A) Permits, if required, have been obtained and included in the proposal. Provisions for handling special conditions of permits have been incorporated in plans or proposal as needed. **Attach a copy of the required permits to this checklist.** (See Environmental Classification Form 1775 for permit information.) {Contact the Environmental Section six months prior to the plan completion date to initiate the permit application process (See MDOT Environmental Contact Directory).}

	REQUIRED	
	Yes	**No**
DEQ-Surface Water Quality (Sanitary)	___	___
DEQ-Drinking Water & Radiological Protection	___	___
DEQ-Land & Water Management	___	___
Corps of Engineers-	___	___
Coast Guard-Navigation Clearance	___	___
Airport-Clearance	___	___
EPA	___	___
NPDES-Notice of Coverage (> 5 acres)	___	___
Other (_____)	___	___

CERTIFICATION & ACCEPTANCE – Type 2

Utility Coordination

_____ (Yes or N/A) All private and municipal utilities relocations, if required, have been completed. If relocation is not to be completed prior to award date, a coordination clause has been included in the proposal. All required reimbursable relocation costs have been authorized. A Utility Relocation Status Report, signed by the Region/TSC utility coordinator, is included in the log/proposal.

_____ (Yes or N/A) This project does not include any work beyond the outside edge of shoulder or require any excavation, trenching, boring, etc. into the aggregate base or subbase material. Guardrail work is not included. A Utility Status - Capital Preventive Maintenance Form, signed by the CPM - Project Manager is included in the log/proposal.

Materials

_____ (Yes or N/A) Guarantee Clauses and Warranties. Bridge painting and landscaping are approved for warranty clauses. Also, other materials may have warranties if properly justified and approved by FHWA (see FAPG 635.413).

_____ (Yes or N/A) Salvaged Highway Materials(guardrails, signs, etc.) delivered to MDOT or other public agencies.

1. A non-federal participating item must be set up to cover cost of transporting salvaged material to an off-site location.
2. A salvage value must be credited to the project if the item's value is more than $5000. (No credit is necessary if the material will be used on another federal-aid project).

_____ (Yes or N/A) Materials furnished by a public agency. A public interest finding is necessary to document that the cost of material is not more than a contract average bid price (See FAPG 635.407).

_____ (Yes or N/A) Alternate products. When necessary to specify a brand name material, a minimum of two brand names "or approved equal" must be specified. Single brand names can only be specified if one of the following apply:

1. Certification is made to FHWA that there are no suitable alternatives.
2. Certification is made to FHWA that the item is needed for synchronization with existing highway facilities. For example: the item is needed to match existing items for ease of maintenance.
3. The item is part of an experimental work plan (See FAPG 635.411).

_____ (Yes or N/A) Non-standard items are covered by special provisions, supplemental specifications or special details in proposal or plans. { All 7000 code numbers not covered in the current Standard Specifications for Construction must have a special provision included in the proposal. All items with item code numbers that are not presently covered by the current Standard Specifications for Construction should have either a Supplemental Specification or a Special Provision written to cover this item (Contact the Specifications and Estimate Unit for information).}

_____ (Yes or N/A) If experimental features are included, an approved work plan has been approved for the experimental feature (FAPG sec.511).

CERTIFICATION & ACCEPTANCE – Type 2

Design

_____ (Yes) The design of the project is in compliance with the Program Guidelines included in the current Capital Preventive Maintenance Program Manual.

_____ (Yes) The format of the plans is in compliance with FAPG 630B, Supplement.

_____ (Yes) Clear roadside cross sections are provided according to 3R guidelines or AASHTO Roadside Design Guide criteria.

_____ (Yes or N/A) Landscaping projects where there is a separate job number for landscaping, should have at least 1/4% of the expenditure for planting native wildflowers. A waiver must be requested for exceptions (See FAPG sec. 752.11). **{Attach a copy of the waiver, if appropriate (see Roadside Development Section for information).}**

Review by Others

_____ (Initials or N/A) Lighting, if required, is in accordance with AASHTO Guide. The Design Engineer - Electrical Unit has reviewed any electrical items included in the plans.

_____ (Initials or N/A) Water main and sanitary sewers relocated within the project limits have been reviewed by the Design Engineer-Municipal Utilities. The Municipal Utilities unit has reviewed any water main or sanitary sewer items included in the plans.

_____ (Initials or N/A) Project drainage, floodplain encroachments, and waterway crossing modifications requiring a DEQ permit and hydraulic information in the plans have been reviewed by the Design Engineer-Hydraulics/Hydrology (See FAPG Sec. 650).

Governmental and Railroad Coordination

_____ (Initials or N/A) Required city, county, township, and/or private party agreements have been initiated.

AGRMNT NO._____ Name of party _____ Purpose_____

AGRMNT NO._____ Name of party _____ Purpose_____

_____ (Initials) Any construction that impacts an at grade railroad crossing or railroad-highway grade separation has been coordinated with the Governmental and Railroad Coordination Unit. All required agreements, special provisions, coordination clauses and railroad force account authorizations have been completed.

FORCE ACCOUNT WORK

_____ (Yes or N/A) An affirmative finding of cost effectiveness for force account work (if required under the program responsibilities of the division) has been transmitted to Design Division. The document includes who will do the work and how it should be coordinated with the contractor.

Consultants

(For CPM projects prepared by MDOT Consultants)

_____ (Yes or N/A) Items of work included in the plans that were prepared by an MDOT Consultant have been reviewed for compliance with MDOT standards, guidelines and procedures.

_____ _____

CPM - Project Manager Date

Michigan Department
of Transportation
0253 (9/03)

CERTIFICATION & ACCEPTANCE – Type 2

4 of 5)

Region/TSC Traffic And Safety Project Review

Control Section _____ Date _____

Job Number _____ Route Number _____

Location _____

Traffic Signs and Delineation

_____ (Yes or N/A) Permanent Signing has been reviewed and found in compliance with the MMUTCD, except as noted under comments below.

_____ (Yes or N/A) Permanent Pavement Marking has been reviewed and found in compliance with the MMUTCD, except as noted under comments below.

Traffic Signals

_____ (Yes or N/A) Traffic signal control devices have been reviewed and found in compliance with the MMUTCD, except as noted under comments below.

Geometric Design

_____ (Yes or N/A) Any geometric design changes or additions have been reviewed and found in accordance with current Geometric Design Guides, except as noted under comments below.

Force Account Work

_____ (Yes or N/A) An affirmative finding of cost effectiveness for force account work (under the program responsibility of this Division, e.g. traffic signals, pavement markings) has been transmitted to the Project Manager. The document includes who will do the work and how it should be coordinated with the contractor.

Guardrail

_____ (Yes or N/A) Any cable guardrail, blunt and/or turned down guardrail endings, and guardrail connections to bridge rails and/or piers within the project limits have been upgraded to current standards.

Consultant

_____ (Yes or N/A) All work performed by an MDOT Consultant in any of the above areas has been reviewed for compliance with MDOT procedures and policies.

Comments

Signature - Region/TSC Traffic & Safety

Date

Michigan Department
of Transportation
0253 (9/03)

CERTIFICATION & ACCEPTANCE – Type 2

(Specifications and Estimates Unit)

Control Section _____ Date _____

Job Number _____ Route Number _____

Location _____

_____

QUALITY ASSURANCE

_____ The plan/proposal package has been reviewed for compliance with MDOT standards, policies and procedures.

SPECIFICATION AND ESTIMATE UNIT PROJECT REVIEW

_____ This project (does or does not) have the capability to support Disadvantaged Business Enterprises. The percent of DBE participation assigned to this project is _____%.

_____ Approval has been given by the Engineer of Design for an advertising period which is less than three (3) weeks for the following reasons:

Comments

_____

_____

_____

_____

_____

_____ The estimated unit prices are reasonable.

_____ Engineering and contingency charges are not more than 5 percent.

The above project is authorized for advertising.

_____ _____

Supervisor, Specifications & Estimates Unit Date

Clear Form